

A Message from the Executive Director

As the restructured BGFMA celebrates its fifth anniversary in June at the **International Bridge Conference** in Pittsburgh, we are already looking forward to the next five years of activities to promote the use of steel grid bridge decks. To educate the next generation of bridge engineers about the benefits of grid deck systems we have started to reach out to college students through their ASCE student chapters and by becoming a financial sponsor for the **2011 National Student Steel Bridge Competition**. Approximately 50 teams are expected to compete at this year's event at Texas A&M University and each team will be judged on categories including steel design, fabrication, scheduling and management. Coincidentally, one judging criteria rewards teams for developing a lightweight structural system – a goal shared by members of the BGFMA.

Mark Kaczinski, P.E.
BGFMA Executive Director

Recent Notable Projects

Hanover Bridge in Franklin, WV – The Hanover Bridge is a small structure (3200 square feet of deck) that only carries about 1000 vehicles per day. However, this bridge is a vital route for residents, as well as the timber and poultry industry in the mountainous WVDOT District 8 region. The original FRP deck deteriorated quickly as water filled many of the FRP sandwich cavities and steel plates were required to bridge across several failed deck panels that had debonded due to excessive deflection.

After a study of various alternatives, the **WVDOT** decided to replace the deck with a cast-in-place Exodermic™ system because of the weight reduction and



Exodermic Deck being Installed



Steel Plate Bridging Failed FRP Deck Panels

speed of construction advantages. All work to install the Bailey Bridges, Inc. supplied Exodermic™ deck was completed using the DOT statewide bridge crew, completing one lane at a time to maintain traffic. David Scott, WV-DOT District 8 Bridge Engineer, and David Whited, Senior Engineering Tech with the WVDOT Highway Maintenance Division and head of the statewide bridge crew, were instrumental in completing this project and they think the Exodermic™ deck system could play a role in rehabilitating other deteriorated West Virginia bridges. David Scott also believes the Exodermic™ deck system could be used on other rehabilitation projects to increase load capacity and bring older bridges up to current load rating standards.

Thomas J. Hatem Memorial Bridge (US 40) over Susquehanna River – Located about 40 miles northeast of downtown Baltimore in Havre de Grace, Maryland this structure is maintained and operated by the **Maryland Transportation Authority (MdTA)**. Carrying roughly 30,000 vehicles per day, the original 70-year old grid deck was replaced during a multi-stage construction project that allowed the owner to maintain traffic in both directions throughout the duration of the project.



Thomas J. Hatem Bridge



Barrier Reinforcement in Place



Screed Check before Pour

L.B. Foster Company supplied the general contractor, **Joseph B. Fay Company**, with over 380,000 square feet of new grid deck panels for the Hatem Bridge project. The replacement deck is a partially filled grid deck with light-weight cast-in-place concrete spanning longitudinally over floor beams at various spacing. *“The L.B. Foster Fab Products team worked closely with Fay to establish the performance criteria required to incorporate real efficiency into this project,”* said Mike Riley of L.B. Foster. The contractor completed the project in less than three years with an average deck replacement rate of approximately 13,000 square feet per month, which includes time required for maintenance and protection of traffic, removal of the existing deck, and other superstructure rehabilitation activities.

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Port Ferdinand Bridge in Barbados, West Indies – The privately owned beachfront marina development in Six Men’s St. Peter will feature nearly 100 luxury condominiums and roughly 120 berths for boats when it is completed. The development will also feature Barbados’ first double bascule bridge, which will be used to span a newly dredged channel connecting the Caribbean Sea and the marina lagoon. The private developer contracted with **E.C. Driver & Associates, Inc.** to determine the movable bridge type, provide a construction budget, perform preliminary and final bridge design, and provide construction phase engineering assistance to the bridge builder. This project was a featured presentation by James M. Phillips III of E.C. Driver at the 13th Biennial Heavy Movable Structures Symposium in October 2010.

While completing this work, E.C. Driver faced several unique challenges above and beyond those typical with movable bridge selection, design, and construction.

1. The small-scale structure spans a 40-foot wide channel with only two lanes, presenting challenges with regard to space for equipment and maintenance access.
2. This structure is only the second movable bridge in Barbados, so movable bridge construction technology and experience is rare or nonexistent on the island.
3. Local resources are limited, such that much of the specialty work for the movable bridge needs to be imported. The location of Barbados makes importing these materials very difficult.



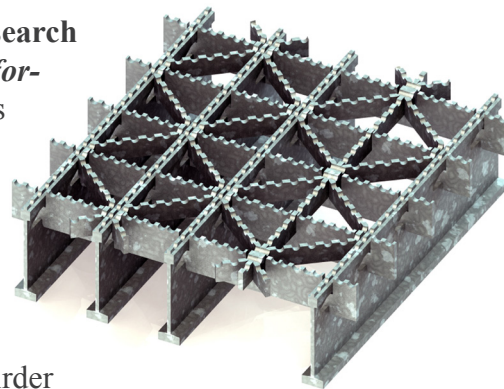
Lifting Section of Bridge
(Photo Courtesy of Crane & Equipment Ltd.)

Considering the many challenges faced by the consultant, and the owner’s request for a durable solid concrete riding surface, an Exodermic™ Bridge Deck system with lightweight concrete was selected as the most appropriate deck type. The deck spanned longitudinally between floor beams spaced at 10’-3”, and weighed only 57.8 pounds per square foot. Although lightweight aggregate was not available in Barbados and had to be imported, (continued next page)

the additional costs were more than offset by savings in the bridge counterweight and machinery. The schedule was maintained despite two deck panels being damaged in shipping. Two replacement panels were fabricated on a fast-track schedule by LB Foster to avoid any delays.

Open Grid Deck Research Efforts

The BGFMA has contributed funding to an **Oregon Transportation Research and Education Consortium (OTREC)** project entitled *“Data and Performance Measures for LRFD Design of Open Grid Bridge Decks.”* This research will be conducted by Professor Christopher Higgins at Oregon State University and contains both analytical and experimental work. The analytical efforts will be used to help update the AASHTO-LRFD code by providing design moments for fatigue, strength and serviceability limit states specifically for welded open grid deck systems. Experimental work will focus on characterizing the performance of standard and alternative weld details, main bar spacing, cross bar sizes, and girder attachment details. Laboratory work is expected to begin this summer and updates will be provided in future BGFMA newsletters and technical bulletins.



Grid Deck Could Save Old Historic Structure

Healdsburg Memorial Bridge over Russian River – Built in 1921, the Pennsylvania Petit through truss has carried Healdsburg Avenue over the Russian River in Sonoma County, CA, for nearly a century. As one of only a handful of bridges in Sonoma County eligible for listing on the U.S. Register of Historic Places, the question of whether the landmark structure gets rehabilitated or replaced is of utmost concern for local residents in Healdsburg, CA.



Healdsburg Memorial Bridge

In order to save the iconic structure from being limited to pedestrian use only, or even worse being demolished and replaced with a concrete structure, a reduction in dead load is required. A potential weight savings of approximately 20 pounds per square foot (35-40% lighter than the existing concrete slab) can be realized if a grid deck with lightweight concrete is installed. Considering the deck system contributes approximately two thirds of the overall dead load of the structure, the weight savings from a new deck is a necessary step in keeping the structure in service.

Mel Amato, Healdsburg resident and a leader of the local push to save the historic structure, organized the group **“Friends of the Healdsburg Memorial Bridge”**. Other locals have joined Mr. Amato by signing petitions and attending City Council meetings to

voice their opinions. To many residents of Healdsburg, the Memorial Bridge is as much a symbol of the city as the Russian River itself. The structure can be rehabilitated for millions of dollars less than building a new structure, which will save the people of Healdsburg money, as well as preserve history.

Many structures around the U.S. face the same possible fate as the Healdsburg Memorial Bridge. In many cases, simply reducing the dead load of the deck system could keep these unique historic structures in service for decades to come!

Grid Facts:

Q: Can lightweight concrete be used in conjunction with grid decking?

A: Yes, in fact lightweight aggregates have been used in grid reinforced concrete bridge decks for many decades to provide one of the lightest weight deck systems available. **The Mackinac Bridge** at the Straits of Mackinac connecting Michigan's upper and lower peninsulas was built in the 1950's with a concrete filled grid deck that utilized lightweight concrete. Recently the deck was inspected, which included taking core samples of the concrete infill, and deemed to be in good condition after over 50 years of service. When lightweight concrete is used in conjunction with grid decks, weights of 50 psf, or less in some cases, can be achieved.

Other structures such as the recently completed **Mathews Bridge** in Jacksonville, FL, **Ben Sawyer Bridge** in Charleston, SC, **17th Street Causeway Bridge** in Fort Lauderdale, FL, and many more have used lightweight concrete in conjunction with a grid deck system to optimize weight savings. BGFMA Associate Member **Carolina Stalite** is a leading supplier of lightweight aggregates, and a valuable resource for information about lightweight concrete mix designs.

More Information:

If you would like to receive more information about the features and benefits of grid deck systems, please contact us at **1-877-257-5499** or **bgfma@bgfma.org**. We are also available to make presentations at your office and can offer continuing education credits for professional engineers as a registered provider in New York and Florida.

BGFMA Tradeshow Schedule:

Please visit BGFMA members at our exhibit booth during the following upcoming bridge engineering conferences:

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| International Bridge Engineering Conference (IBC) | June 5-8 | Pittsburgh, PA |
| NYC Bridge Conference | July 25-26 | New York, NY |
| Western Bridge Engineers Conference | September 25-28 | Phoenix, AZ |
| Ohio Transportation Engineering Conference (OTEC) | October 25-26 | Columbus, OH |
| Associated Pennsylvania Constructors (APC) Conference | November 16-18 | Hershey, PA |



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